

Niveau(x) d'enseignement: 3
Centre d'intérêt: 74

Numéro EDUQ : 9270388

Genesee, Fred.

Evaluation of the enriched French program at Westmount Park Elementary School : report 2 / F. Genesee, B. Stefanovic. -- [Montréal] : Commission des écoles protestantes du Grand Montréal, Instructional Services Department, 1976.
ii, 24 f. : graph. ; 28 cm.

"A report submitted by the Instructional Services Department to the Protestant School Board of Greater Montreal". Résumé en français au début du v. Bibliographie: f. 20.

Cote Dewey: 372.654/G327e

Cote LC: LB/1528

Descripteur(s): *Français (Langue) *Langue seconde *Evaluation de l'apprentissage *Evaluation de programmes *Maternelle (Niveau) *Primaire (Niveau)

Identificateur(s) de nom: *Ecole Westmount Park (Westmount, Québec)

Identificateur(s) de sujet: *Enseignement enrichi

L'étude présente les résultats d'une seconde évaluation du programme enrichi d'enseignement du français langue seconde (à raison de 75 minutes par jour) mis en place à l'école Westmount Park. Les élèves des trois premières années du primaire participant à ce programme en 1975-1976 ont été comparés à un groupe de contrôle suivant le programme régulier de français langue seconde dans une autre école. Les élèves de Westmount Park ont été répartis en deux groupes selon qu'ils avaient fréquenté la maternelle française ou anglaise.

La comparaison a porté sur les seuls tests de compréhension auditive et d'expression orale. Le nombre d'élèves participant à l'enquête a varié pour chacun des tests. Il varie entre 10 et 21 pour chacun des degrés d'enseignement des trois groupes: enseignement enrichi avec maternelle française, enseignement enrichi avec maternelle anglaise, groupe de contrôle. Au total, plus de cent élèves de la région de Montréal ont répondu aux tests, au printemps 1976.

Les conclusions suivantes se dégagent de l'étude: 1. Les élèves ayant participé au programme enrichi, à l'école Westmount Park, ont acquis en français une habileté supérieure, dans les domaines de la compréhension et de l'expression, à celle démontrée par les élèves du programme régulier; 2. Le fait d'avoir fréquenté une maternelle française à l'école Westmount Park ne se traduit pas nécessairement, à long terme, par une maîtrise accrue du français; 3. L'acquisition d'habiletés en français sur le plan de la communication interpersonnelle ne dépend pas nécessairement du niveau d'intelligence de l'enfant.

Type de document: r
Région(s) administrative(s): 063
Notice(s) connexe(s): 8270394
Financement: Bénéficiaire - BEPGM
 Organisme(s) source(s) - MEQ - DGEES
 Programme(s) de subvention - PDEL
Auteur de l'analyse: ar

Evaluation of the Enriched French
Program at Westmount Park Elementary
School. - Report 2-

Fred Genesee
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- Report 2 -

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B. Stefanovic

A report submitted by the Instructional ~~Services~~
Department
to
The Protestant School Board of Greater Montreal
October 1976

ACKNOWLEDGEMENTS

We would like to express our thanks to Mr. A.L. Tedford, Principal, Westmount Park School, to Mrs. B.A. Hendry, Principal, Kensington School, and to their teachers for their generous assistance and cooperation.

We wish also to express our appreciation to Dr. E.G. Cochrane, Director of Instructional Services, for his comments on a draft of this report.

RESUME

Ce projet avait pour but d'évaluer l'efficacité du programme enrichi d'enseignement du français langue seconde (à raison de 75 minutes par jour) à l'école Westmount Park. Les élèves des 1ère, 2ème et 3ème années participant à ce programme ont été comparés à un groupe de contrôle d'élèves suivant le programme régulier de français langue seconde dans une autre école. Cette comparaison a porté sur les tests de compréhension auditive et d'expression orale. Les élèves de l'école Westmount Park ont été répartis en deux groupes selon qu'ils avaient déjà fréquenté la maternelle en français (groupe expérimental no 1) ou la maternelle en anglais (groupe expérimental no 2).

On s'est aperçu que les élèves du groupe expérimental no 1, et ce à tous les niveaux, ont obtenu aux tests de compréhension auditive et d'expression orale, de meilleurs résultats que les élèves du groupe de contrôle. De même, les élèves du groupe expérimental no 2 ont obtenu au test d'expression orale, de meilleurs résultats que les élèves du groupe de contrôle. Les élèves du groupe expérimental no 2 ont également obtenu dans certains tests de compréhension auditive de meilleurs résultats que les élèves du groupe de contrôle; les différences entre les résultats obtenus à ces tests proviennent des différents niveaux auxquels étudient les élèves. Qui plus est, les élèves du groupe expérimental no 1 ont obtenu aux tests de compréhension auditive et à ceux d'expression orale, au niveau de la 1ère année, des résultats supérieurs à ceux obtenus par les élèves du groupe expérimental no 2; il n'y a pas eu de différence notable entre ces deux groupes en ce qui a trait aux résultats obtenus aux tests en 2ème et en 3ème année. Enfin, nous n'avons pu établir aucun lien entre,

d'une part, l'acquisition en français des habiletés dans les domaines de la compréhension et de l'expression orale, et d'autre part le niveau d'intelligence non-verbale de l'élève. Nous en avons conclu ce qui suit:

1. Les élèves ayant participé au programme enrichi d'enseignement du français à l'école Westmount Park ont acquis en français une habileté supérieure, dans les domaines de la compréhension et de l'expression, à celle démontrée par les élèves du programme régulier.
2. Le fait d'avoir fréquenté une maternelle française à l'école Westmount Park peut ne pas offrir d'avantages à long terme au point de vue maîtrise supérieure du français.
3. L'acquisition en français d'habileté sur le plan de la communication interpersonnelle ne dépend pas nécessairement du niveau d'intelligence de l'enfant.

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This report presents the results of the second evaluation of the Westmount Park French program. The program has existed since 1972, and is offered to all students in grades 1 to 6 in the school. In fact, there is no optional regular French or Immersion program in the school at these grade levels. At the Kindergarten level, students may follow the regular English program with French-as-a-second language (FSL) or they may take an all-French program, which is essentially equivalent to the Immersion program at the Kindergarten level.

In grades 1 to 6, the students follow an "enriched program" of French, which includes approximately 75 minutes/day of language instruction. The exact scheduling and nature of the program vary somewhat from year to year owing to such variables as changes in teaching personnel and so on. For example, in 1974-75, grades 1 to 6 (whole classes) spent 60 minutes daily with a French Specialist plus 15 minutes daily in French with the classroom teacher. In 1975-76, however, French Specialists taught whole classes for 60 minutes twice weekly, half classes for 30 minutes thrice weekly, and small groups of children new to Quebec for 30 minutes twice weekly. In addition, every Wednesday was "un jour français" when all teachers were encouraged to use common classroom expressions in French in their classes.

Although the initial intent of the program was to allocate part of the time to teaching French as a second language (FSL) and part of the time to teaching subject matter in French, the former has proven more

successful so that most of the time is now devoted to FSL. The extended time for French, however, allows for greater variety in teaching French as a second language than in the regular program.

In last year's evaluation (Genesee & Chaplin, 1975) we found no statistically significant differences between the Westmount Park French group and a control group of comparable students following the regular French-as-a-second language program on any of the French language tests; the evaluation was carried out at the grade 4 level. The test battery included the Test de Rendement en Français (IV), the Test de Rendement en Mathématiques (IV), a test d'écoute, the Test de Lecture "California", and an oral production evaluation. There was one important qualification to the conclusion of the report and that was that the Westmount Park students who had participated in the evaluation had not taken the all-French program in Kindergarten; rather they had taken the regular English Kindergarten program with FSL. Consequently, the current evaluation investigated the significance of the Kindergarten program on subsequent second language learning in the Westmount Park program by including grade 1, 2 and 3 students who had taken the all-French Kindergarten option. Only listening comprehension and oral production skills were evaluated in the current study since prior discussion with the Westmount Park French teachers indicated that other types of testing, such as reading and mathematics, would be unsuitable at these grade levels. The decision was also made to eliminate testing of English language skills since there was no a priori reason to suspect that these would be affected by participation in the program.

In summary, the purpose of the current study was to evaluate the development of listening comprehension and oral production skills in the French language among students in grades 1, 2 and 3 of Westmount Park French program in comparison to those of students following an FSL program.

THE SAMPLE

Three groups of students participated in the evaluation:

- 1) Anglophone students from Westmount Park Elementary School who were enrolled in the enriched French program since grade 1 and had taken the all-French Kindergarten option (Experimental I);
- 2) Anglophone students from Westmount Park Elementary School who had been enrolled in the enriched French program since grade 1 but had taken the English option with FSL in Kindergarten (Experimental II);
- 3) Anglophone students from Kensington Elementary School who were following the regular English program with French-as-a-second language (Control).

Students from grades 1, 2 and 3 were included. A distinction was made between the Westmount Park students who had taken the all-French Kindergarten program and those who had taken the English Kindergarten program in order to assess the immediate and long-term effect of the additional school grade in an all-French program. For example, one would

expect that the Experimental I group would demonstrate an advantage over the Experimental II group on French language tests at the grade 1 level. The question arises, "Will that advantage persist through the higher grades?"

TEST BATTERY

Two French language tests were administered, a listening comprehension test and an oral production test.

1.

(1) Listening Comprehension

The Ontario Institute for Studies in Education French Comprehension Test (Experimental Edition) was used to assess comprehension skills. This test was designed for use with Anglophone students in French Immersion programs and was felt to be appropriate for testing of these students. The test consists of four sections which evaluate the comprehension of (1) words, (2) phrases, (3) sentences and (4) paragraph-length material. The student responds to items presented orally by choosing among four pictures the one which corresponds to the question. Reading skills are not required to take the test. In some cases the questions require associative comprehension skills, e.g., matching a picture to a spoken word. In some cases the questions require interpretative comprehension skills. For the purposes of data analysis, sections 1 and 2 were combined to give a single score (words and phrases) with a maximum possible value of 43, and sections 3 and 4 were combined to yield one score (sentences and paragraphs) with a maximum possible value of 22.

Prior discussions with the Westmount Park French teachers indicated that the Kindergarten level of the test would be suitable for the grade 1 students and the Grade 1 level for the grades 2 and 3 students. A summary of the number of students who took this test according to grade, group and sex is presented in Table 1.

TABLE 1

SUMMARY OF SAMPLE SIZES FOR
LISTENING COMPREHENSION TESTING

	GRADE 1		GRADE 2		GRADE 3	
	<u>MALE</u>	<u>FEMALE</u>	<u>MALE</u>	<u>FEMALE</u>	<u>MALE</u>	<u>FEMALE</u>
EXPERIMENTAL: I	6	7	12	9	7	9
EXPERIMENTAL: II	7	6	9	8	5	10
CONTROL:	11	8	8	7	12	7

(2) Oral Production

Samples of the children's speaking skills were elicited by having each child describe a cartoon picture. Afterwards, the interviewer engaged the child in a short conversation about the cartoon or other topics which interested the child. The interviews were conducted by native French-speaking Canadians. Each student was interviewed individually in a quiet room. The interviews were tape recorded for

later analyses. Not all students who had taken the listening comprehension test took the test; for a summary of the sub-sample which participated in this part of the evaluation see Table 2.

TABLE 2

SUMMARY OF SAMPLE SIZES FOR
THE ORAL PRODUCTION TESTING

	GRADE 1		GRADE 2		GRADE 3	
	<u>MALE</u>	<u>FEMALE</u>	<u>MALE</u>	<u>FEMALE</u>	<u>MALE</u>	<u>FEMALE</u>
EXPERIMENTAL: I	6	7	12	6	6	9
EXPERIMENTAL: II	5	6	5	5	5	5
CONTROL:	10	9	7	7	11	8

Each student's speech sample was later rated by two native French-speaking Canadians independently using a 5-point rating scale along five dimensions: compréhension, prononciation, grammaire, vocabulaire, and communication. The dimension of "communication" was intended to assess the students' willingness to speak French and their ease and comfort while doing so. A rating of 5 on a dimension indicates native-like or excellent performance on the dimension while a rating of 1 indicates very poor performance. The speech samples for the different groups and grade levels were presented to the evaluators in a mixed

random order. The evaluators were "blind" to the grade level and language program of each student.

RESULTS

For a brief explanation of the statistical terminology used in this section of the report see Appendix A.

(1) Listening Comprehension

Separate two-way analyses of variance (least squares solution) were performed on the Words and Phrases scores and on the Sentences and Paragraphs scores at each grade level. The main variables were Group (Experimental I, Experimental II, Control), and Sex (male, female). For a summary of the average scores and the associated F and P values from the statistical analyses, see Table 3.

There were statistically significant differences among the groups at all grade levels. The Control students scored lower than the Experimental I students on both sections of the test at all grade levels. In grade 1, the Control students ($\bar{X} = 18.17$) scored significantly lower than the Experimental II students ($\bar{X} = 25.62$) on the Words and Phrases section of the test but not significantly differently on the Sentences and Paragraphs section (Control = 7.56; Experimental II = 10.43). In grade 2, the Control students scored significantly lower than the Experimental II students on both sections of the test. In grade 3,

TABLE 3

SUMMARY OF LISTENING COMPREHENSION
TEST RESULTS

	EXPERIMENTAL I (French K)	EXPERIMENTAL II (English K)	CONTROL	F RATIO	d f
<u>GRADE 1:</u>					
Words/phrases	30.88 **	25.62 **	18.17	37.95***	2, 38
Sent./para	13.61 **	10.43 *	7.56	8.58***	2, 38
<u>GRADE 2:</u>					
Words/phrases	23.94 **	22.61 **	12.81	27.96***	2, 44
Sent./para	13.60 **	13.11 **	7.52	18.21***	2, 44
<u>GRADE 3:</u>					
Words/phrases	23.13	20.70 **	17.14	5.65**	2, 44
Sent./para	14.50 **	13.90 **	9.62	9.42***	2, 44

* $p < .05$; ** $p < .01$; *** $p < .001$.

1. Scores which are joined by a line differ significantly from one another; the level of significance is indicated by one, two or three asterisks above each line (Newman-Keuls Multiple Comparisons Tests, Ferguson, 1974).

the Control students ($\bar{X}=17.14$) did not score significantly differently from the Experimental II students ($\bar{X} = 20.70$) on the Words and Phrases section but they did score significantly lower on the Sentences and Paragraphs section (Control = 9.62; Experimental II = 13.90. Thus, from a developmental perspective, it appears that participation in the French Kindergarten program gave the Experimental I students an advantage over the Control students from the outset in both simple comprehension skills and more complex comprehension skills and that they maintained this advantage at all grade levels. The Experimental II program, however, which lacks the French Kindergarten component, seems to have given the participating grade 1 students an advantage over their peers in the regular FSL program on the more simple comprehension skills but not on the more complex ones, in which both groups might be said to be still equally weak. By grade 2, however, the students who had followed the Experimental II program demonstrated greater competence than students from the FSL program in both types of comprehension skills. Finally, in grade 3, the FSL students' skills in more simple types of comprehension tasks had improved to the point that they scored as well as the Experimental II students on this section of the test. The former group, however, still lagged behind the Experimental II group on the more complex types of comprehension tasks.

Interestingly, the Experimental I group scored significantly higher than the Experimental II group on both sections of the test at the grade 1 level only; there were no significant differences between these two

groups at the grade 2 and 3 levels.

Visual inspection of the grade 2 and 3 results for all three groups suggests that there was no major improvement in performance over the time span. This was particularly true of the two experimental groups; the Control group demonstrated greater increments in performance on the two sections of this test than did the other groups. A similar comparison between grades 1 and 2 cannot be made because different levels of the test were used. Nevertheless, the possibility of a "plateau effect" in this program should be monitored.

There were no significant differences between the girls and boys in grade 1 or in grade 2. However, the grade 3 girls (Words = 27.06; Sentences = 16.48) scored significantly higher than the grade 3 boys (Words = 21.75; Sentences = 13.24) on both sections of the test (Words: $F(1,65) = 69.83$; $p < .001$; Sentences: $F(1,65) = 21.88$; $p < .01$).

(2) Oral Production

Separate two-way analyses of variance (least squares solution) were carried out on the scores at each grade level from the Oral Production evaluation: compréhension, prononciation, grammaire, vocabulaire and communication. The main variables were School Group (Experimental I, Experimental II, Control) and Sex (male, female). For a summary of the average ratings at each grade level, along with the associated F and p values, see Table 4.

TABLE 4

SUMMARY OF ORAL PRODUCTION TEST RESULTS

	EXPERIMENTAL I (French K)	EXPERIMENTAL II (English K)	CONTROL	F RATIO	d f
<u>GRADE 1:</u>					
Compréhension	3.67 **	2.80 * **	2.13	15.71***	2, 37
Prononciation	3.61	3.44	3.11	1.57	2, 37
Grammaire	2.31 **	.07 **	.06	13.87***	2, 37
Vocabulaire	2.73 **	1.68 **	1.35	20.02***	2, 37
Communication	3.43 ** **	2.60 ** **	2.29	13.18***	2, 37
<u>GRADE 2:</u>					
Compréhension	4.10 **	3.95 **	2.29	31.03***	2, 36
Prononciation	3.85 **	3.95 **	3.32	9.03***	2, 36
Grammaire	3.27 **	3.75 **	.21	38.29***	2, 36
Vocabulaire	2.98 **	2.90 **	1.39	15.03***	2, 36
Communication	3.79 **	3.60 **	2.32	33.24***	2, 36

TABLE 4 (cont.)

	EXPERIMENTAL I (French K)	EXPERIMENTAL II (English K)	CONTROL	F RATIO	d f
<u>GRADE 3:</u>					
Compréhension	3.86 **	3.55 **	2.62	10.51***	2, 38
Prononciation	3.63 **	3.75 **	3.09	10.59***	2, 38
Grammaire	2.74 *	2.80 *	.94	6.73**	2, 38
Vocabulaire	2.72 *	2.65 **	1.82	6.54**	2, 38
Communication	3.47 *	3.35 *	2.72	5.75**	2, 38

* $p < .05$; ** $p < .01$; *** $p < .001$.

The Control group was rated significantly lower than the Experimental I group on all scales at all grade levels, with the exception of the pronunciation scale of the grade 1 evaluation, where there were no significant differences between any of the groups. These findings are similar to those on the listening comprehension test.

The Control students were rated at the same level as the Experimental II students at the grade 1 level on four of the five oral production scales, the one exception being listening comprehension, where the Experimental II students ($\bar{X} = 2.80$) were rated higher than the Control students ($\bar{X} = 2.13$). The listening comprehension result is consistent with the results from the group administered listening comprehension test. At the grade 2 and 3 levels, the Experimental II students were rated significantly higher than the Control students on all scales of the evaluation.

Finally, as was found on the O.I.S.E. listening comprehension test, the Experimental II students scored significantly lower than the Experimental I students on the oral production scales at the grade 1 level only; there were no significant differences between the two groups on any of the scales at the grade 2 and 3 levels. The one exception to this was on the pronunciation scale at grade 1, where there was no significant difference.

To assess the students' acquisition of listening and speaking skills from grade 1 to grade 3, the average total score at each grade level has

been calculated by combining all five scale values. These averages are presented in Table 5.

TABLE 5

AVERAGE TOTAL ORAL PRODUCTION RATINGS

	Experimental <u>I</u>	Experimental <u>II</u>	<u>Control</u>
Grade 1:	3.15	2.12	1.79
Grade 2:	3.60	3.63	1.91
Grade 3:	3.28	3.22	2.24

As was the case for listening comprehension skills, it is evident that there is the suggestion of a plateau effect at the grade 3 level for oral production skills. Again, this was especially true of the experimental groups, both of which were actually rated somewhat lower in grade 3 than in grade 2, whereas the Control group was rated more highly in grade 3 than in grade 2. Since the evaluators listened to the taped speech samples of students from different grade levels in a mixed random order, any differences in level of competence between the two grade levels should have been evident. It is possible that this plateau effect reflects differences in the characteristics of the students in the grade 2 and 3 samples such as pertain to attitude or motivation. Notwithstanding this possibility, these findings corroborate a similar

asymptotic trend in performance which was demonstrated on the O.I.S.E. listening comprehension test.

(3) Second Language Acquisition and Intelligence

It has been found in a number of previous evaluations in the P.S.B.G.M. that students with below average I.Q. scores achieved the same level of competence in those aspects of the French language which are related to interpersonal communication as did students with average and above average I.Q. scores (Genesee, 1976). These previous studies were carried out with students at the grade 4 level or higher. The current study at Westmount Park afforded the opportunity to investigate the relationship between "intelligence" and second language learning among younger students. Therefore, we administered the Ravens Progressive Matrices (1956), coloured version, to the grade 1, 2 and 3 students in the Experimental I and II groups at Westmount Park. Time constraints prohibited testing students in the Control group. The Ravens test is an individual or small-group test which is widely used with young children and is purported to measure non-verbal intelligence. The test consists of a series of problems, graded in difficulty, in which the child must select from among six alternatives the one which completes a larger geometric pattern. The test is not timed so that each child works at his/her own speed. For purposes of the current analysis, the student's score consisted of the total number of correct items. All students must answer all items.

The Ravens scores of the students at each grade level were then

correlated (Pearson Correlation Coefficient)^{2.} with their scores on the language tests described previously. This allowed us to determine to what extent the students' performance on the French language tests could be predicted by their I.Q. level or by their performance on the Ravens test. A summary of the correlation coefficients (r) at each grade level and for each language test is presented in Table 6.

TABLE 6

SUMMARY OF CORRELATION COEFFICIENTS
BETWEEN RAVENS SCORES AND LANGUAGE SCORES

	<u>Grade 1</u>	<u>Grade 2</u>	<u>Grade 3</u>
<u>Listening Comprehension:</u>			
Words & Phrases	.35	-.22	-.01
Sentences & Paragraphs	.39 *	.11	.14
<u>Oral Production:</u>			
Listening Comprehension	-.02	.25	.30
Pronunciation	.12	.004	.02
Grammar	.28	.14	.22
Vocabulary	.13	.12	.10
Communication	.18	-.004	.11

* $p < .05$

2. See Appendix A for a brief explanation of correlation.

Only one of the 21 correlation coefficients which were calculated was significant. This means that for the most part performance on the listening comprehension tests and the oral production measures could not be predicted by the students' intelligence level, as measured by the Ravens test, at any better than chance level. Thus, these findings corroborate similar findings at higher grade levels.

SUMMARY AND CONCLUSIONS

The current evaluation found that:

- (1) students in the Westmount Park French program who had taken the French Kindergarten option scored consistently higher on both oral production and comprehension tests than students in the regular program with FSL;
- (2) Westmount Park students with French Kindergarten scored higher than Westmount Park students with English Kindergarten on oral production and listening comprehension tests only at the grade 1 level; there were no significant differences between the two groups on either type of test at the grade 2 and 3 levels;
- (3) The Westmount Park students with English Kindergarten scored consistently higher than the FSL students on the oral production measures;
- (4) The Control students lagged in their development of listening

comprehension skills when compared to the Westmount Park students with English Kindergarten, they had reached parity by grade 3 on the more simple types of comprehension skills; and

(5) using intelligence, as measured by Ravens Progressive Matrices, to predict level of second language proficiency proved relatively unsuccessful, suggesting that acquisition of oral production and listening comprehension skills in a second language does not necessarily depend upon intelligence level.

These findings seem inconsistent with last year's. However, the discrepancy may be explained in part by the plateau effect among the experimental students and in part by the lag effect among the FSL students. That is to say, if the experimental students really do experience a relative leveling off in second language acquisition by grade 3, and if the results for the FSL students represent a developmental lag which can be reduced or eliminated over time, then the failure to find differences between the groups at the grade 4 level may reflect the results of these two tendencies. While this explanation may be satisfactory for the listening comprehension test results, it does not explain the oral production test results in any simple way. Therefore, other explanations or variables, such as teacher-related ones, may have to be invoked to reconcile the findings from these two evaluations.

In conclusion, there is evidence that students in the Westmount

Park program, and especially those who take the French Kindergarten option, achieve greater competence in oral production and listening comprehension skills in French than do students following the regular FSL program. On the other hand, there was no evidence in this evaluation that participation in the French Kindergarten program gave the children a long-term advantage over children who had participated in the English Kindergarten program. In this respect, it is relevant to point out that the French Kindergarten option has been discontinued at Westmount Park. The findings from the research suggest that this should have no long-term effect on the quality of the students' French language skills. Finally, there was no evidence that the acquisition of oral production and listening comprehension skills was related to the students' level of intelligence.

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APPENDIX A

Analysis of variance is a mathematical procedure for testing the statistical reliability of the differences among a series of mean scores. Stated simply, an analysis of variance estimates how much of the variability in the test scores is due to the systematic effects of the experimental treatment, which in the current report is the school language program, and how much of the variability is due to non-systematic influences, such as individual differences among the children. The first estimate is generally called the "treatment variance" and the second estimate is called the "error variance". The ratio of the treatment variance to the error variance is called an F ratio. If the treatment variance is larger than the error variance the F ratio will be greater than 1. If the error variance is larger than the treatment variance the F ratio will be less than 1. A very small F ratio indicates that most of the variability in the scores is due to unsystematic individual differences which are unrelated to the particular treatment in question.

To decide whether a particular F ratio is "significant" or, in other words, whether there is a significant difference between the average scores, one must determine the probability (or p value) of obtaining an F ratio of a certain magnitude. The p value can be

ascertained easily with the assistance of standard mathematical tables, that have already been set up, and a knowledge of the "degrees of freedom" for your particular experiment. There is a degrees of freedom value associated with the numerator, or treatment variance, of the F ratio, and a degrees of freedom value associated with the denominator, or error variance, of the F ratio. There is no brief way of discussing the calculation or significance of degrees of freedom so that for the sake of this explanation they will not be discussed further.

According to tradition, the probability (or p value) associated with a particular F ratio must be 5 out of 100 (i.e., .05) or less ($p < .05$) before one calls the difference between the averages "significant". If the p value is greater than 5 out of 100 (i.e., $> .05$), then one calls the difference between the averages "non insignificant". What one is saying when one says " $p < .05$ " is that the probability of getting a particular F ratio and, therefore, a particular difference between average scores is less than 5 in 100 by chance alone. One then goes on to assume that, since the probability is relatively low, the difference between the mean scores is probably due to the treatment and not to chance or uncontrolled influences. In other words, the treatment (or language of schooling in this report) has had a significant influence on the students' performance on the language tests. Of course, the converse rationale holds for the reverse situation where $p > .05$.

This explanation of analysis of variance, F ratios,

p values and significance is of necessity brief, but hopefully will facilitate the reader's understanding of the article. More thorough and mathematical descriptions of these concepts can be found in Statistical Analysis for Psychology and Education, 3rd ed., G.A. Ferguson, McGraw-Hill, 1971, and Statistical Principles in Experimental Design, 2nd ed., B.J. Winer, McGraw-Hill, 1971.

Correlation is a mathematical procedure for describing the degree of covariation between two variables. A correlation coefficient ranges in value from a maximum of ± 1.00 to a minimum of $.00$. For example, take the case of scholastic performance and I.Q. A correlation of 1.00 between these two variables would mean that all of the variation (i.e., 100%) in scholastic performance can be attributed to variation in I.Q. This, in turn, means that if you knew the person's I.Q., you could predict with perfect accuracy what his scholastic performance would be. If the correlation coefficient were less than 1.00 , for example $.50$, then less than all of the variation (less than 100%) in scholastic performance can be attributed to variation in I.Q. To determine the exact amount of covariation between two sets of scores, the correlation coefficient is squared and converted to a percentage. Thus, in the above example of $.50$, 25% of the variation in scholastic performance can be attributed to the variation in I.Q. However, since there is still 75% of the variation in scholastic performance which cannot be attributed to the I.Q. variable, there is still a great deal of variance which is unaccounted for, and prediction becomes

correspondingly less accurate. Thus, as the correlation coefficient becomes smaller, prediction becomes less accurate.

A correlation coefficient may have a negative value or a positive value. Negative correlation means that the relationship between the two variables is inverse so that those who have high scores on one variable have low scores on the other. A positive correlation means that the higher the person's score on one variable, the higher his score will be on the second one.

Thus, correlation coefficients describe the direction and degree of relationship between two variables. They do not, however, establish the nature of the relationship. That is to say, correlation by itself does not establish a cause-effect relationship between two variables. It simply describes the amount of covariation between them.

FOOTNOTES

1. We would like to thank the Bilingual Education Project, Ontario Institute for Studies in Education, for permission to use their Comprehension Test.